RESEARCH ARTICLE

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Received: 17.07.2020
Acceptance: 11.07.2021
DOI: 10.18521/ktd.770869

The results of this study were presented with number OP-021 in part at 17th National Family Medicine Congress on November 2, 2019, in Ankara, Turkey.

Konuralp Medical Journal
e-ISSN1309–3878
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Evaluation of the Effect of Physical Activity on Sleep Quality and Cardiovascular Disease Risk in Women in the Postmenoposal Period in Turkey

ABSTRACT

Objective: Menopause is a period of life in which women are at increased risk of cardiovascular diseases and sleep problems. In this study, we aimed to determine the effect of physical activity on CVR and sleep quality in women in this period.

Methods: The study was conducted with 342 postmenopausal women (PMW) who met the inclusion and exclusion criteria who applied to the outpatient clinic between August and December 2018 at Health Sciences University Dışkapı Yıldırım Beyazıt Training and Research Hospital. Women were given sociodemographic data form, International Physical Activity Questionnaire short form(IPAQ-SF), Pittsburgh Sleep Quality Index (PSQI) , calculated CVR estimation with Framingham formulation. The data were evaluated with SPSS 23 program.

Results: In our study the mean age of women was 60.77 ± 9.2 years. The rate of patients with a 10-year CVR was 66.1%. The Pittsburgh Sleep Quality (PSQI) scorewas 9.05 ± 4.33 and the rate of good sleep quality (PSQI ≤5) was 24.6%. Physical activity (PA) level was found to be 848.68 ± 1213.08 MET-min /week. It was observed that the state of being physically inactive was associated with the presence of a diagnosis of hypertension (p = 0.026). It was observed that those with severe PA levels in women had low body mass index (BMI) (p = 0.035), and increased CVD as the BMI and daytime dysfunction increased. Cardiovascular risk (CVR), sleep quality score and subparameters did not change according to physical activity. While there was a significant difference between the severity of PA level and Framingham risk score (FRS) (p = 0.032), those with high PA levels had the lowest FRS. Sleep quality and subparameters did not change according to PA level. In the presence of obesity, CVR, habitual sleep afficiency and sleep disorder component scores were shown to increase.

Conclusions: From the pre-menopausal period, women should be directed to perform appropriate PA to reduce obesity and prevent the onset or progression of CVD. Sleep hygiene trainings can be given to improve sleep quality in the postmenopausal period.

Keywords: Cardiovascular Diseases, Exercise, Postmenopause, Sleep.

Postmenopozal Dönemdeki Kadınlarda Fiziksel Aktivitenin Uyku Kalitesi ve Kardiyovasküler Hastalık Riskine Etkisinin Değerlendirilmesi

ÖZET

Amaç: Menopoz dönemi kadınların kardiyovaskülerhastalık(KVH) riskinin ve uyku sorunlarının arttığı yaşam dönemidir. Çalışmada bu dönemdeki kadınlarda fiziksel aktivitenin kardiyovasküler riskve uyku kalitesine etkisini saptamayı amaçladık.

Gereç ve Yöntem: Çalışma, Sağlık Bilimleri Üniversitesi Dışkapı Yıldırım Beyazıt Eğitim ve Araştırma Hastanesi'nde 2018 yılı Ağustos-Aralıkayları arasında polikliniğe başvuran dahil olma ve dışlanma kriterleri karşılayan 342 postmenopozal kadın ile yapılmıştır. Kadınlara sosyodemografik veri formu, Uluslararası Fiziksel Aktivite Anketi kısa form, Pittsburgh Uyku Kalite İndeksi uygulanmış, Framingham formülasyonu ile kardiyovasküler risktahmini hesaplanmıştır. Alınan veriler SPSS 23. programı ile değerlendirilmiş, Pearson korelasyon, ANOVA ve Ki-kare test teknikleri kullanılmıştır.

Bulgular: Çalışmamızda kadınların yaş ortalaması 60,77±9,2 yıl idi. 10 yıllık KVR yüksek olanların oranı %66,1 idi. Pittsburgh Uyku Kalitesi (PUKİ) Skoru 9,05±4,33 ve iyi uyku kalitesine (PUKİ ≤5) sahip olanların oranı %24,6 idi. Fiziksel aktivite düzeyi 848,68±1213,08 MET-dk/hafta olarak saptandı. Fiziksel olarak aktif olmama durumunun hipertansiyon tanısı varlığı ile ilişkili olduğu görülmüştür. (p=0,026). Kadınlarda fiziksel aktivite düzeyi şiddetli olanların beden kitle indeksinin(BKİ) düşük olduğu (p = 0,035) , beden kitle indeksi ve gündüz işlev bozukluğu arttıkça KVR'ninarttığı görüldü. Kardiyovasküler riskile uyku kalite skoru ve alt parametreleri fiziksel aktiviteye göre değişmedi. Fiziksel aktivite düzeyinin şiddeti ile Framingham risk skoru(FRS) arasında anlamlı fark olduğu (p=0,032) , fiziksel aktivite düzeyi yüksek olanların FRS en yüksek iken fiziksel aktivite düzeyi düşük olanların FRS en düşüktü. Uyku kalitesi ve alt parametreleri fiziksel aktivite düzeyine göre değişmedi. Obezite varlığında kardiyovasküler risk, alışılmış uyku etkinliği ve uyku bozukluğu komponent skorunun arttığı gösterildi.

Sonuç: Menopoz öncesi dönemden itibarenobeziteyi azaltıp KVH'ınbaşlamasını veya ilerlemesini önlemek için kadınlar uygun fiziksel aktivite yapmaya yönlendirilmelidir. Postmenopozal dönemde uyku kalitesini arttırmak amacıyla uyku hijyeni eğitimleri verilebilir.

Anahtar Kelimeler: Egzersiz, Kardiyovasküler Hastalık, Postmenopoz, Uyku.

INTRODUCTION

Menopausal and postmenopausal period make up about one third of women's life, and it is estimated that there will be 1.1 billion post-menopausal women in the world by 2025 (1).

It has been shown that during the normal physiological process of menopause, it can contribute to a number of cardiometabolic risks such as central obesity, reduced glucose tolerance, increased blood pressure, abnormal levels of plasma lipids, and vascular inflammation with decreased ovarian follicle function (1). As a result of the decrease in estrogen in the postmenopausal period, the risk of developing cardiovascular diseases (CVD), osteoporosis, visceral obesity and type II diabetes is higher (2,3). As there is no longer any estrogen protection, it can lead to an increased prevalence of diabetes, atherosclerosis, and CVD (4,5).

The risk of developing depression, stress, anxiety and emotional distress increases in women during the menopause transition, and sleep disorder is higher in postmenopausal and menopausal transition compared to women in premenopause (6,7) It is known that irregular sleep duration and timing may be novel risk factors for CVD, regardless of traditional CVD factors and sleep amount or quality (11). Decreased physical activity has been shown to be strongly associated with cardiovascular risk profiles in the postmenopausal women population (8). Women who are physically active have been found to have better body composition and lower cardiovascular risk profiles (8,9) .Physical exercise in postmenopausal women significantly contributes to metabolic fitness and decreased cardiovascular risk, additionally (12). Physical activity and exercise have been shown to increase sleep time and provide significant improvements in sleep quality and delay in falling asleep (13,14).

It is important to know for physicians working with this age group that appropriate physical exercise has an impact on the risk of CVD and sleep problems, and it may be a helpful CVD preventive intervention. Physical exersize is strongly recommended for women in the postmenopausal period, regardless of their form. Beneficial physical activity includes exercise that will promote cardiovascular fitness (aerobic), muscle strength (resistance), flexibility (stretching), and balance (many of the preceding, and additional activities such as yoga) (15).

In the limited studies on postmenauposal women (PMW) and physical activity are mostly conducted by sports medicine, special techniques and special tests made in the laboratory environment were used. We think that more suitable and clear physical activity index/ questionnaires which will provide comfortable and quick evaluation should be used in primary care, but there are few studies with validity and reliability in Turkish (16,17). In this study we aimed to examine the relationship between sleep quality, physical activity and risk of cardiovascular disease using a comprehensive and valid tool in women in the postmenopausal period, practically.

MATERIAL AND METHODS

Study Population: It is a cross-sectional and descriptive study conducted in a University Hospital Family Medicine Clinic between August 31 and December 1,2018.

As the universe of the study, the number of women over the age of 50 who applied to the family medicine outpatient clinic for a period of 3 months was found to be 6426. CVD prevalence in post-menopausal women is evaluated as 30%, we plan to include 383 patients in our study in order to ensure 95% confidence interval and 5% margin of error in the Statcalc program. Women in the menopausal period who agreed to participate in the study were included; those who have malignancy who are not actively receiving chemotherapy treatment, those who have been diagnosed with obstructive sleep apnea, urinary incontinence and psychiatric illness (depression, bipolar disorder, schizophrenia, anxiety disorder, posttraumatic stres disorder, etc.) Patients with a problem and mental illnesfs were excluded from the study.

Data Collection Tools

Sociodemographic Data: A questionnaire consisting of questions about age, marital status, level of education, occupation, accompanying chronic diseases, medications, smoking status, use of tea, coffee or energy drinks after 7 pm, last menstruation, uterineorovarian surgery were applied to the patients in the postmenopausal period. There are a total of 11 questions evaluating the usage of hormone replacement therapy after menopause.

Anthropometric and Blood Pressure Measurements: Body Mass Index (BMI) and Systolic (SBP) and diastolic (DBP) blood pressures were measured and recorded of women's included to the study.

Physicial Activity(PA) Measures: The Turkish version of the International Physical Activity Assessment Questionnaire (IPAQ)-Short form was used to evaluate PA intensities (16). The amount of PA (vigorous, moderate, walking and sitting) of the participants during the last week was questioned. The term MET (Metabolic Equivalent of Task) is used to refer to the amount of oxygen consumed at the time of physical activity. A score as MET-min day is obtained by multiplying the minutes, days and MET values (16). In this study, inactive PA level was defined as <600 MET- minute/week; low intensity(minimal active) PA level was defined as 600-3000 MET-minute/week and sufficient PA level for health (high intensity) was defined as >3000 MET- minute/week (17).

Sleep Measures: In our study, PSQI, which gives a quantitative measurement of sleep quality, was used to define good and bad sleep. It contains a total of 24 questions. In scoring the PSQI, seven

component scores are derived, each scored 0 to 3. This questionnaire addresses seven self reported components of sleep including, sleep quality, sleep duration, sleep latency, sleep disturbance, use of sleep medication, day time dysfunction, and habitual sleep efficiency. The component scores are summed to produce a global score (range 0 to 21). Higher scores score indicates worse sleep quality, with a score ≥ 5 (18).

CVR Factors Measurement: Framingham Risk Score (FRS) is used to assess the 10-year CVD risk. Age, systolic blood pressure, using antihypertensive, history of diabetes, current smoking status, total cholesterol and HDL cholesterol values are used (1).

Statistical Methods: For analyzing the data collected, descriptive and inferential statistics were performed with SPSS® IBM 23.0 software in 95% confidence level. In the study, One Way ANOVA, and chi-squared tests were used. In determining the relationship between the two groups, the relationship with Pearson correlation Analysis was determined. Statistical significance level was accepted as <0.05 in all analyzes.

RESULTS

The mean age of the women included in the study was 60.77 ± 9.2 years and 39.2% (n = 134) were 50-59 years old, 69.3% (n = 237) were married, 56.4% (n = 193) primary school graduates, 84.5% (n = 289) were unemployed. Mean height was 155.48 ± 8.01 cm, and weight was 79.75 ± 15.39 kg, and BMI mean was 32.88 ± 6.22 kg / m2. 67.3% of the women were obese and 9.1% of the participants were smoking. Tea, coffee, and energy drinks consume rate after e was 71.6%.

It was found a statistically significant relationship between the presence of hypertension, education level and BMI and physical activity levels, it was observed that being physically inactive was associated with the presence of a diagnosis of hypertension, being illiterate, and obesity decreased by performing severe physical activity (Table 1).

Table 1. Cardiovascular and menopause features and lifestyle habits of women according to their physical activity levels (*Chi-Squared Test)

		Physical activity level				
		inactive n (%)	Low intensity n (%)	High intensity n (%)	X^2	p
Age(years)	Under 50 age	15 (42.9)	19 (54.3)	1 (2.9)	4.669	0.587
	50-59 age	68 (50.7)	59 (44)	7 (5.2)		
	60-69 age	57 (51.4)	46 (41.4)	8 (7.2)		
	70 age and older	37 (59.7)	21 (33.9)	4 (6.5)		
Marital Status	Married	125 (52.7)	98 (41.4)	14 (5.9)	0.350	0.839
	Single	52 (49.5)	47 (44.8)	6 (5.7)		
Education Level	Uneducated	71 (59.2)	38 (31.7)	11 (9.2)	10,465	0,005*
	Educated	106 (47.7)	107(48.2)	9(4.1)		
Employmentstatus	Retired	15 (38.5)	22 (56.4)	2 (5.1)	8.034	0.090
	Employed	4 (28.6)	8 (57.1)	2 (14.3)		
	Unemployed	158 (54.7)	115 (39.8)	16 (5.5)		
Hypertension	No	68 (47.6)	69 (48.3)	6 (4.2)	11.053	0.026*
	Yes	109 (54.8)	76 (38.6)	14 (6.6)		
Diabetes	No	115 (50.7)	101 (44.5)	11 (4.8)	2.015	0.365
	Yes	62 (53.9)	44 (38.3)	9 (7.8)		
Hypercholesterolemia	No	134 (52.8)	107 (42.1)	13 (5.1)	1.108	0.575
	Yes	43 (48.9)	38 (43.2)	7 (8)		
Coronary Artery Disease	No	156 (52.3)	125 (41.9)	17 (5.7)	0.351	0.839
	Yes	21 (47.7)	20 (45.5)	3 (6.8)		
Hypothyroidism	No	156 (52.7)	122 (41.2)	18 (6.1)	1.311	0.519
	Yes	21 (45.7)	23 (50)	2 (4.3)		
The presence of other diseases	No	112 (50.7)	93 (42.1)	16 (7.2)	2.224	0.329
	Yes	65 (53.7)	52 (43)	4 (3.3)		
Diabetes medication use	No	122 (51.9)	102 (43.4)	11 (4.7)	1.933	0.380
	Yes	55 (51.4)	43 (40.2)	9 (8.4)		
Use of anti-hypertensive medications	No	75 (49)	71 (46.4)	7 (4.6)	2.216	0.330
	Yes	102 (54)	74 (39.2)	13 (6.9)		
Cholesterol medication use	No	151 (53)	121 (42.5)	13 (4.6)	5.340	0.069
	Yes	26 (45.6)	24 (42.1)	7 (12.3)		
Thyroid replacement therapy	No	157 (52.9)	122 (41.1)	18 (6.1)	1.637	0.441
	Yes	20 (44.4)	23 (51.1)	2 (4.4)		
Allergy medication use	No	175 (51.8)	143 (42.3)	20 (5.9)	0.294	0.863
	Yes	2 (50)	2 (50)	0 (0)		
Use of other drugs	No	110 (49.3)	98 (43.9)	15 (6.7)	1.938	0.380
	Yes	67 (56.3)	47 (39.5)	5 (4.2)		
BMI(kg / m^2)	NormalRange	12 (41.4)	14 (48.3)	3 (10.3)	11.019	0.026*
	Overweight	47 (57.3)	26 (31.7)	9 (11)		
	Obese	117 (50.9)	105 (45.7)	8 (3.5)		
Current smoker	Yes	15 (48.4)	15 (48.4)	1 (3.2)	0.764	0.683
	No	162 (52.1)	130 (41.8)	19 (6.1)		
Drinking tea. coffee. energy drinks after 7 pm	Yes	122 (49.8)	110 (44.9)	13 (5.3)	2.348	0.309
	No	55 (56.7)	35 (36.1)	7 (7.2)		

In the analyzes, it was observed that the PSQI score was 9.05 ± 4.33 and 24.6% of the women had good sleep quality. Lipid profiles, blood pressures and sleep quality characteristics were compared according to PA levels, but no statistically significant difference was found (Table 2).

Table 2. Blood pressure. serum lipid values and sleep quality characteristics by physical activity levels.

	Physical activity level			F	*p* value
	Inactive Mean ± SD.	Low intensity Mean ± SD	High intensity Mean ± SD		
Systolic blood pressure (mmHg)	131.95±21.46	128.89±17.54	136.7±20.78	1.845	0.160
Diastolic blood pressure(mmHg)	81.49±13.02	81.12±11.02	83.15±14.25	0.243	0.784
Total cholesterol(mg/dl)	206.83±42.43	211.36±82.77	209±36.49	0.208	0.812
LDL cholesterol (mg/dl)	145.42±31.68	144.03±31.85	143.05±29.11	0.106	0.900
HDL cholesterol (mg/dl)	48.67±9.95	49.04±12.07	53.2±12.21	1.521	0.220
Triglycerides (mg/dl)	176.66±95.28	205.35±545.31	143.45±45.79	0.403	0.669
Subjective sleep quality	1.59±0.94	1.41±1.05	1.15±0.93	2.668	0.071
Sleep latency	1.91±1.08	1.93±1.1	1.8±1.2	0.127	0.881
Sleep duration	1.1±1.22	1.22±1.2	1.05±1.23	0.455	0.635
Habitual sleep efficiency	1.29±1.13	1.37±1.17	1.3±1.08	0.187	0.830
Sleep disturbance	1.82±0.54	1.68±0.57	1.8±0.77	2.520	0.082
Use of sleep medication	0.19±0.69	0.26±0.82	0.35±0.93	0.603	0.548
Dysfunction of daytime	1.29±1.01	1.17±0.99	1.05±1.05	0.908	0.404

* One-way ANOVA test; HDL. high density lipoprotein; LDL. low-density lipoprotein.

Relationship Between PA, FRS and Sleep Quality Parameters: There was a weak negative relationship between women's PA score and BMI (r = -0,201) (Table 3). There was no statistically significant relationship between women's PA score and FRS, and between PA score, sleep score and sleep parameters, but there was weak positive correalation between FRS and BMI of women (p=0,013, r = 0,135), and FRS dysfunction during daytime score (p=0,002, r = 0.171)(Table 3).

Table 3. Relationship Between Physical Activity Score and BMI, FRS, Sleep Quality Parameters.

	Physical activity score		**Framingham Risk Score**	
	r	*p-value*	***r***	***p*-value**
BMI	**-0.201***	0.002*	**0.135***	0.013*
PSQI score	0.017	0.757	0.091	0.093
Subjective sleep quality	-0.006	0.919	0.077	0.153
Sleep latency	-0.082	0.128	0.007	0.897
Sleep duration	-0.020	0.713	-0.003	0.959
Habitual sleep efficiency	0.006	0.916	-0.002	0.972
Sleep disturbance	0.043	0.425	0.090	0.095
Use of sleep medication	-0.024	0.653	0.063	0.242
Dysfunction of daytime	0.079	0.145	**0.171***	0.002*

*p < 0.05 pearson correlation r:correlation coefficient

But there was a statistically significant difference in FRS, habitual sleep efficacy component score, sleep disorder score among different BMI women. In another way, in terms of BMI and FRS there was a significant difference between women with inactive, low and very active PA levels (p <0.05), but there's not statistically significant difference in terms of PSQI score (Table 4). There was a statistically significant difference in FRS, habitual sleep efficacy component score, sleep disorder score among women with different BMI (p=0,035). According to the level of physical

activity, BMI and FRS were associated but PSQI was not related (See in table 4). Those with higher BMI were more inactive, and women with the highest FRS were the most active. There were similarities between physical activity groups in terms of PSQI scores.

Table 4. Comparison of BMI. FRS. PSQI score in terms of Physical Activity Level.

	Physical activity level			
	inactive n=177	Low intensity n=145	High intensity n=20	p
	Mean ± SD.	Mean ± SD.	Mean ± SD.	
BMI	33.58±6.88	32.39±5.31	30.28± 5.22	0.035*
FRS	14.54±7.91	12.61±7.78	16.35±8.25	0.032*
PSQI score	9.19 ±4.22	8.99±4.37	8.45±5.07	0.745

BMI. body mass index;FRS.framingham risk score;PSQI.Pittsburgh sleep quality index
*p<0.05.ANOVA

DISCUSSION

It is well-known that the prevalence of CVD in PMW is higher than that of premenopausal women and men of the same age, because estrogen deficiency is considered an important factor leading to cardiovascular diseases (19). Nevertheless, physical activity, sleep quality in menopausal women, and their effects on CVD risk, there is a few study that evaluates all aspects (20,21). Our study aims should be evaluated as a whole these problems and CVR factors were evaluated by FRS. Scheltens T, et al. Also evaluated the risk of cardiovascular disease under the age of 60 with both FRS and SCORE and found to be similar (21.) In our study, the rate of those with a high risk of CVD was found to be 66.1% of PMW over 50 ages by FRS. In an another large population-based study it was found higher total and low-density lipoprotein cholesterol levels, SBP and BMI as CVR factors in PMW over 50 ages than premenauposal ones (22).These show that even over the age of 50 or in the postmenopausal period increases the risk.

Long-term sitting time is a common feature of modern society that includes television viewing, screen time, computer use, desk work sedentary behaviors at home (23).In this study, the PA levels of the participants that were 51.75% were inactive and 42.4% were low-active, and sitting time of women was 525.32 minutes per day. In addition to the high rate of chronic diseases, low educated and unemployed in this age group, we think that the elderly in our country generally prefer home activities such as watching TV to outdoor activities such as sports and walking. In already overweight and obese PMW, a strong positive correlationbetween sitting time and CVD markers has been demonstrated like our participants (24).Postmenopausal women often complain of disturbed and unsatisfactory sleep. According to a study 46.7% of participants scoring over 5 on the PSQI (25). This common health problem has some long-term consequences of sleep disruption in otherwise healthy individuals include hypertension, dyslipidemia, CVD, weight-related issues, metabolic syndrome, and T2DM. (26). In this study population mostly have at least one chronic disease like diabetes, hypertension but we excluded initially those with psychiatric, neurological or obstructive pulmonary disease, medical problems were not associated with sleep quality consequently.

Most studies have reported that PA affects sleep quality positively like the study conducted by Wu et al., low PA level was associated with poor sleep quality (27), and the study by Magee et al. they found an association between low PA with poor sleep quality and high BMI (28). Although the relationship has not been detected with sleep quality and PA levels in our study, the subgroup score of daytime dysfunction was associated with CVR in terms of FRS.

The total PSQI score, especially sleep latency, habitual sleep efficiency, and sleep disturbance scores were significantly increased in postmenopausal women. In addition to BMI, hypertension, diabetes, smoking, marital status, PA showed a positive correlation with high PSQI score and menopausal symptoms (29). Similarly, in our study, it was found that in women with different BMI, the usual sleep efficiency and sleep disorders core increased. In our study, CVD does not change according to the sleep score. There is a weak positive correlation between the FRS daytime dysfunction score. As daytime dysfunction increases, CVD increases. In another study conducted by Zhou et al., it was found that subjects with sleep disorders had older, obese, menopause and had higher blood pressure and an increased waist-to-hip ratio. In addition, hyperlipidemia and glucose disorders were observed in the group with sleep disorders. It has been shown that there is an increasing tendency to sleep prevalence during menopause (30). In a study by Cappuccio et al., people who reported that they slept 5 hours or less at night were considered to be a higher risk group for cardiovascular morbidity and mortality, and long sleep duration was associated with more CVD (31). This may be one of there as ons why we found the CVR score too high. In a prospective study

involving 66 postmenopausal women, a diet and exercise program was applied to patients, and FRS decreased by 3% after 3 months (32). Unlike our study, a significant relationship was found between PA and FRS. The absence of such a relation in our study can be explained by not having sufficient sample size.

Strengths and Limitations of the Research: The strength of our research; data collection tools are applied by a single researcher, face to face with each patient. In addition, our study is a field work conducted by family physicians and it is important for preventive medicine. Our research was carried out in a single center, low sociocultural, immobile, obese and almost homogeneous sample. In order to generalize the results of there search to all PMW in the country, more detailed studies on the subject should be conducted in different groups in different areas in order to repeat the study with a larger sample group and to prevent problems of the menopausal period. There is a need for studies where sleep quality is evaluated with more objective methods such as polysomnography. Physicalactivity should be examined with a more comprehensive and specific tool. Because there are deficiencies in determining the characteristics of women's activities such as homestate and transportation.

CONCLUSION

Women should be given a lifestyletraining that includes variables such as nutrition and exercise, starting before the menopause period with appropriate methods that will create behavioral changes in adults. In order to reduce obesity, post-menopausal women should be encouraged and guided to practice physical activities suitable for their physical and financial conditions, away from conditions that limit the PA of the person such as computers and TV. Grading the risk of CVD with FRS plays an impressive role in implementing medical treatment and behavioral changes that can prevent the onset or progression of cardiovascular disease, and allows more patients to be noticed earlier. It is considered that this study is important in terms of showing the effect of PA on sleep quality and the risks of cardiovasculardisease in women of this age group in the current health agenda, where active aging comes to thefore, which will help other studies in the field. Sleep hygiene trainings can be given to increase sleep quality.

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